What is claimed is:

1. A method for compensating electronic measurement apparatus for at least one of time and temperature drift of electronic components, comprising the steps of:

providing either:

a) a first signal representative of a first value of a physical variable and a second signal representative of a second value of the same physical variable; or

b) a first signal representative of a difference between a first value of a physical variable and a second value of the same physical variable, and, a second signal available at the location of the measurement and at the location of the measurement apparatus, the second signal being one of:

i) a system ground potential;

ii) a static potential other than system ground; and

iii) a dynamic potential;

providing at least one difference signal by one of:

a) obtaining the difference between the first and second signals at a gain factor greater than one, or equal to one, or less than one, to produce the difference signal; or

b) attenuating the difference between the first and second signals using passive components to produce the difference signal; or

c) comparing the first signal with the second signal, the dfference signal being one of:

i) said first signal is substantially the difference signal in respect to said second signal, which is at the system ground potential; or

ii) the difference between said first signal in respect to the second signal, which is at the static potential; or

iii) the difference beween said first signal in respect to said second signal, at a given time, the second signal being the dynamic potential;

providing at least one ambient condition signal responsive to the ambient condition of at least one of a) the physical variable and b) temperature for providing an ambient condition signal which when measured provides a measured ambient condition;

storing calibration information used for compensating the electronic measurement apparatus for drift of electronic components;

operating in a reference calibration mode, in which at least one reference curve representative of at least one associated difference parameter value versus measured ambient condition is produced, the difference parameter value being either a difference signal measurement or value derived from a difference signal measurement, said curve referred to as a difference parameter reference curve being acquired over a range of ambient conditions and stored, the reference curve so generated in the reference calibration mode being referred to as a difference parameter reference curve, and one or

more such difference parameter reference curves being referred to as a set of difference parameter reference curves, and:

a) if the associated difference parameter value is representative of difference measurement input offset, then the difference parameter reference curve is more specifically referred to as a difference reference curve, and

b) if the associated difference parameter value is representative of difference measurement gain, then the difference parameter reference curve is more specifically referred to as a difference gain reference curve, and

c) if the associated difference parameter value is representative of difference measurement common mode, then the difference parameter reference curve is more specifically referred to as a difference CMR reference curve, and

d) if the associated difference parameter value is representative of difference measurement power supply rejection, then the difference parameter reference curve is more specifically referred to as a difference PSR reference curve;

operating in a standard calibration mode, in which at least one difference parameter reference curve is substantially compensated for drift over time by an associated difference curve offset value, which is determined at a current arbitrary ambient condition by comparing at least one expected difference parameter value determined from the difference parameter reference curve, at the current arbitrary ambient condition, to at least one determined difference parameter value, measured or derived from a difference signal measurement, at the current arbitrary ambient condition; and

performing at least one difference measurement in the operational mode, in which a measurement representative of current ambient condition provides a measured ambient condition which is correlated to at least one current difference parameter value, the current difference parameter value being associated with the difference parameter reference curve, and the current difference parameter value being at least one of:

a) determined from a translated difference parameter reference curve at the measured ambient condition, the translated difference parameter reference curve being the difference parameter reference curve after translation by the difference curve offset value associated with the difference parameter reference curve during operation in the standard calibration mode;

b) determined from the difference parameter reference curve at the measured ambient condition, and translated by the difference curve offset value associated with the difference parameter reference curve as determined in the standard calibration mode;

c) substantially equivalent to the determined difference parameter value determined during the standard calibration mode and associated with the difference parameter reference curve; and

d) derived by empirically comparing difference parameter values associated with the difference parameter reference curve at various times during operation in the standard calibration mode at various ambient conditions;

the current difference parameter value being used to correct the difference signal measurement for component drift to provide a compensated difference signal measurement between the first and second values of the physical variable.

2. A method as defined in claim 1 wherein at least one difference parameter reference curve is re-acquired and compared to a previous version of the difference parameter reference curve to at least one of a) estimate error in the linear translations, associated with the standard calibration mode, and b) track trends in drift of the difference parameter reference curve.

3. A method as defined in claim 1, further comprising the steps of at least one of:

responding to a substantially equal and arbitrary value of the physical variable, during both the reference calibration mode, and during the standard calibration mode, and wherein operation of the electronic measurement apparatus in the reference calibration mode, responsive to the substantially equal and arbitrary value of the physical variable, results in at least one additional reference curve referred to as a physical variable difference curve distinct from difference parameter reference curves, which is used during the standard calibration mode, when again subject to a substantially equal and arbitrary value of the physical variable, to compare points on the physical variable difference curve, acquired at different times, so as to provide at least one physical variable curve offset value which substantially compensates for variations between the electronic components, over the range of ambient conditions in which the physical variable difference curve is acquired, and additionally to substantially compensate for time drift in the variation over

the ambient condition range in which the physical variable difference curve was acquired during the reference calibration mode; and

responding to a substantially repeatable difference in values of the physical variable, during both the reference calibration mode, and during the standard calibration mode, and wherein operation of the electronic measurement apparatus in the reference calibration mode, responsive to the substantially repeatable difference in values of the physical variable, results in at least one additional reference curve referred to as a physical variable difference curve distinct from difference parameter reference curves, which is used during the standard calibration mode, when again subject to said substantially repeatable difference in values of the physical variable, to compare points on the physical variable difference curve, acquired at different times, so as to provide at least one physical variable curve offset value which substantially compensates for variations between the electronic components, over the range of ambient conditions in which the physical variable difference curve is acquired, and additionally to substantially compensate for time drift in the variation over the ambient condition range in which the physical variable difference curve was acquired during the reference calibration mode, and

the physical variable difference curve, with the set of difference parameter reference curves being collectively referred to as a set of reference curves.

4. A method as defined in claim 2 wherein errors associated with the linear translations in the standard calibration mode are at least one of a) reported to a user as an indicator of achievable accuracy, b) used to limit the accuracy with which difference measurements are reported to the user, and c) used with tracked trends in drift of the

respective reference curves to predict drift in the respective reference curves, in order to improve the accuracy with which measurements are reported to the user.

5. A method as defined in claim 1 wherein at least one of the first and second signals provides a substantially random signal source.

6. Apparatus for compensating electronic measurements for at least one of time and temperature drift of electronic components, comprising:

means for providing either:

a) a first signal representative of a first value of a physical variable and a second signal representative of a second value of the same physical variable; or

b) a first signal representative of a difference between a first value of a physical variable and a second value of the same physical variable, and, a second signal available at the location of the measurement and at the location of the apparatus, the second signal being one of:

i) a system ground potential;

ii) a static potential other than system ground; and

iii) a dynamic potential;

at least one difference signal means for one of:

a) amplifying the difference between the first and second signals by a gain factor greater than one, or equal to one, or less than one, to produce the difference signal; or

b) attenuating the difference between the first and second signals using passive components to produce a difference signal; or

c) comparing the first signal with the second, the difference signal being one of:

i) said first signal is substantially the difference signal in respect to said second signal, which is at the system ground potential; or

ii) the difference between said first signal in respect to the second signal, which is at the static potential; or

iii) the difference between said first signal in respect to said second signal, at a given time, the second signal being the dynamic potential;

at least one ambient condition signal means responsive to the ambient condition of at least one of a) the physical variable and b) temperature for providing an ambient condition signal which when measured provides a measured ambient condition;

analog to digital converter means coupled to the difference signal means and the ambient condition signal means for converting the difference signal produced by the difference signal means and the ambient condition signal provided by the ambient condition signal means into digital form;

computer means for compensating the electronic measurement apparatus for drift of electronic components;

memory means for storing calibration information used for compensating the electronic measurement apparatus for drift of electronic components;

the apparatus being operable in a reference calibration mode, in which at least one reference curve representative of at least one associated difference parameter value versus measured ambient condition is produced, the difference parameter value being either a difference signal measurement or value derived from a difference signal measurement versus measured ambient condition, said curve referred to as a difference parameter reference curve being acquired over a range of ambient conditions and stored in the memory means, the reference curve so generated in the reference calibration mode being referred to as a difference parameter reference curve, and one or more difference parameter reference curves being referred to as a set of difference parameter reference curves, and:

a) if the associated difference parameter value is representative of difference measurement input offset, then the difference parameter reference curve is more specifically referred to as a difference reference curve, and

b) if the associated difference parameter value is representative of difference measurement gain, then the difference parameter reference curve is more specifically referred to as a difference gain reference curve, and

c) if the associated difference parameter value is representative of difference measurement common mode, then the difference parameter reference curve is more specifically referred to as a difference CMR reference curve, and

d) if the associated difference parameter value is representative of difference measurement power supply rejection, then the difference parameter reference curve is more specifically referred to as a difference PSR reference curve;

the apparatus additionally being operable in a standard calibration mode, in which at least one difference parameter reference curve is substantially compensated for drift over time by an associated difference curve offset value, which is determined at a current arbitrary ambient condition by comparing at least one expected difference parameter value determined from the difference parameter reference curve, at the current arbitrary ambient condition, to at least one determined difference parameter value, measured or derived from a difference signal measurement, at the current arbitrary ambient condition; and

the apparatus for performing at least one difference measurement in the operational mode, in which a measurement representative of current ambient condition provides a measured ambient condition which is correlated to at least one current difference parameter value, the current difference parameter value being associated with the difference parameter reference curve, and the current difference parameter value being at least one of:

a) determined from a translated difference parameter reference curve at the measured ambient condition, the translated difference parameter reference curve being the difference parameter reference curve after translation by the difference curve offset value associated with the difference parameter reference curve during operation in the standard calibration mode;

b) determined from the difference parameter reference curve at the measured ambient condition, and translated by the difference curve offset value associated with the difference parameter reference curve as determined in standard calibration mode;

c) substantially the determined difference parameter value obtained during the standard calibration mode and associated with the difference parameter reference curve; and

d) derived by empirically comparing difference parameter values associated with the difference parameter reference curve at various times during operation in the standard calibration mode at various ambient conditions; and

the current difference parameter value being used to correct the difference signal measurement for component drift to provide a compensated difference signal measurement between the first and second values of the physical variable.

7. Apparatus as defined in claim 6 wherein the difference signal means comprises differential inputs coupled to a measurement bridge comprising a first sensor having an impedance responsive to the physical variable, the first sensor being connected in series to a first impedance, the first sensor and first impedance being connected across a measurement bridge potential for producing the first signal, and the first sensor and first impedance being connected in parallel to a second sensor having an impedance responsive to the same physical variable as the first sensor, the second sensor being connected in series with a second impedance, the series-connected second sensor and second impedance

also being connected across the measurement bridge potential for producing the second signal, and the inputs to the difference signal means being coupled to the measurement bridge, such that each differential input is coupled to the measurement bridge at a different bridge node, situated between either the first sensor and first impedance or between the second sensor and second impedance.

8. Apparatus as defined in claim 7 wherein the first and second sensors are at least one of:

configured to be subject to a substantially equal and arbitrary value of the physical variable, to which the sensors are responsive, during both the reference calibration mode, and during the standard calibration mode, and wherein operation of the electronic measurement apparatus in the reference calibration mode, with the first and second sensors subject to a substantially equal and arbitrary value of the physical variable, results in at least one additional reference curve referred to as a physical variable difference curve distinct from difference parameter reference curves, which is used during the standard calibration mode, with the first and second sensors again subject to a substantially equal and arbitrary value of the physical variable, to compare points on the physical variable difference curve, acquired at different times, so as to provide at least one physical variable curve offset value which substantially compensates for variations between the sensors, over the range of ambient conditions in which the physical variable difference curve is acquired, and additionally to substantially compensate for time drift in the variation over the ambient condition range in which the physical variable difference curve was acquired during the reference calibration mode; and

configured to be subject to a substantially repeatable difference in values of the physical variable, to which the sensors are responsive, during both the reference calibration mode, and during the standard calibration mode, and wherein operation of the electronic measurement apparatus in the reference calibration mode, with the first and second sensors subject to the substantially repeatable difference in values of the physical variable, results in at least one additional reference curve referred to as a physical variable difference curve distinct from difference parameter reference curves, which is used during the standard calibration mode, with the first and second sensors again subject to said substantially repeatable difference in values of the physical variable, to compare points on the physical variable difference curve, acquired at different times, so as to provide at least one physical variable curve offset value which substantially compensates for variations between the sensors, over the range of ambient conditions in which the physical variable difference curve is acquired, and additionally to substantially compensate for time drift in the variation over the ambient condition range in which the physical variable difference curve was acquired during the reference calibration mode, and

the physical variable difference curve, with the set of difference parameter reference curves being collectively referred to as a set of reference curves.

9. Apparatus as defined in claim 7 wherein the measurement bridge potential is applied across a reference resistance bridge to generate at least one reference signal used to compensate the ambient condition signal means for component time drift.

10. Apparatus as defined in claim 7 wherein at least one input to the ambient condition signal means is coupled to one of the first and second sensors of the measurement bridge.

11. Apparatus as defined in claim 7 wherein the first and second sensors are responsive to temperature.

12. Apparatus as defined in claim 7 wherein the potential across the measurement bridge is at least one of a) applied to an input of the analog to digital converter means in order to provide a ratiometric compensation for variations in bridge voltage and b) generated using the analog to digital converter means.

13. Apparatus as defined in claim 9 wherein the potential across the reference resistance bridge is at least one of a) applied to an input of the analog to digital converter means in order to provide a ratiometric compensation for variations in bridge voltage and b) generated using the analog to digital converter means.

14. Apparatus as defined in claim 6, further comprising a timer and wherein at least one difference parameter reference curve is re-acquired at a known time, relative to the time at which the difference parameter reference curve was last acquired and compared to a previous version of the difference parameter reference curve to at least one of a) estimate error in the linear translations, associated with the standard calibration mode, and b) track trends in drift of the difference parameter reference curve.

15. Apparatus as defined in claim 8, further comprising a timer and wherein at least one of: a) at least one difference parameter reference curve; and, b) at least one physical variable difference curve is re-acquired at a known time, relative to the time at

which the respective reference curves were last acquired, and compared to previous versions of the respective reference curves to at least one of a) estimate error in the linear translations, associated with the standard calibration mode, and b) track trends in drift of the respective reference curves.

16. Apparatus as defined in claim 14 wherein errors associated with the linear translations in the standard calibration mode are at least one of a) reported to a user as an indicator of achievable accuracy, b) used to limit the accuracy with which difference measurements are reported to the user, and c) used with tracked trends in drift of the respective reference curves to predict drift in the respective reference curves, in order to improve the accuracy with which difference measurements are reported to the user.

17. Apparatus as defined in claim 6 wherein at least one of the first and second signals provides a substantially random signal source.

18. Apparatus as defined in claim 6 wherein the means for providing the first signal representative of a first value of the physical variable comprises a first sensor and the means for providing the second signal representative of a second value of the same physical variable comprises a second sensor and wherein the first and second sensors are at least one of:

configured to be subject to a substantially equal and arbitrary value of the physical variable, to which the sensors are responsive, during both the reference calibration mode, and during the standard calibration mode, and wherein operation of the electronic measurement apparatus in the reference calibration mode, with the first and second sensors subject to a substantially equal and arbitrary value of the physical variable, results

in at least one additional reference curve, referred to as a physical variable difference curve distinct from difference parameter reference curves, which is used during the standard calibration mode, with the first and second sensors again subject to a substantially equal and arbitrary value of the physical variable, to compare points on the physical variable difference curve, acquired at different times, so as to provide at least one physical variable curve offset value which substantially compensates for variations between the sensors, over the range of ambient conditions in which the physical variable difference curve is acquired, and additionally to substantially compensate for time drift in the variation over the ambient condition range in which the physical variable difference curve was acquired during the reference calibration mode; and

configured to be subject to a substantially repeatable difference in values of the physical variable, to which the sensors are responsive, during both the reference calibration mode, and during the standard calibration mode, and wherein operation of the electronic measurement apparatus in the reference calibration mode, with the first and second sensors subject to the substantially repeatable difference in values of the physical variable, results in at least one additional reference curve, referred to as a physical variable difference curve distinct from difference parameter reference curves, which is used during the standard calibration mode, with the first and second sensors again subject to said substantially repeatable difference in values of the physical variable, to compare points on the physical variable difference curve, acquired at different times, so as to provide at least one physical variable curve offset value which substantially compensates for variations between the sensors, over the range of ambient conditions in which the physical variable

difference curve is acquired, and additionally to substantially compensate for time drift in the variation over the ambient condition range in which the physical variable difference curve was acquired during the reference calibration mode; and

the physical variable difference curve, with the set of difference parameter reference curves being collectively referred to as a set of reference curves.

19. Apparatus as defined in claim 6 wherein a first ambient condition signal means is responsive to the ambient condition of a first physical variable to provide a first ambient condition signal and at least one second ambient condition signal means is responsive to a second physical variable for providing a second ambient condition signal, both the first and the second ambient condition signals being converted by the analog to digital converter means into digital form and stored in the memory means for use by the computer means for compensating the electronic measurement apparatus for drift of electronic components due to variations in the ambient value of the first and second physical variables, and wherein at least two sets of reference curves are acquired over the range of the first physical variable, each set of reference curves being acquired at a different value of ambient condition of the second physical variable within the range of ambient conditions of the second physical variable.

20. Apparatus as defined in claim 19 wherein at least one of the first and second physical variables is temperature.

21. Apparatus as defined in claim 19 wherein multiple second physical variables are representative of the same physical parameter in different physical locations.

22. Apparatus as defined in claim 6 wherein drift parameters associated with the difference signal means are stored in the memory means and used to determine at least one difference parameter reference curve.

23. Apparatus as defined in claim 6 wherein the physical variable is a voltage.

24. Apparatus as defined in claim 23, further comprising at least one additional component, coupled to at least one input of the difference signal means for manifesting a physical property other than voltage as a difference voltage which can be computationally translated into a value of the physical property, using at least one known property value for the additional component and the value of the difference voltage, and wherein the additional component is configured to be in substantially the same state during the reference calibration mode, as well as during the standard calibration mode, and wherein operation of the electronic measurement apparatus in the reference calibration mode, with the additional component configured to be in substantially the same state, results in at least one additional reference curve, referred to as a physical property reference curve distinct from the other reference curves, which is used during the standard calibration mode, with the additional component configured to be in substantially the same state, to compare points on the physical property reference curve, acquired at different times, so as to provide at least one physical property reference curve offset which substantially compensates for variations in the additional component over the range of ambient conditions in which the physical property reference curve is acquired, and additionally to substantially compensate for time drift in the variations over the ambient condition range

in which the physical property reference curve was acquired during the reference calibration mode, and

the physical property reference curve, with other reference curves being collectively referred to as a set of reference curves.

25. Apparatus as defined in claim 23 wherein the apparatus is a digital multimeter.

26. Apparatus as defined in claim 24 wherein the apparatus is a digital multimeter.